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PAPERS

IN

MECHANICS.

MECHANICS.

The GOLD MEDAL, *or* THIRTY GUINEAS, *at the Option of the Candidate, were this Session adjudged to* Dr. THOMAS COGAN *of Bath for his Invention of a* DRAG, *for raising the Bodies of Persons who have sunk under Water.—Class* 140.

Dr. COGAN *preferred the honorary Reward.*

The following Communication was received from him. An ENGRAVING *is annexed, and the two* DRAGS *described are preserved in the Society's Repository.*

SIR,

FROM the Reports of the Royal Humane Society for the year 1805, I learn, that a premium is offered by the Society instituted in London, for the Encouragement of Arts, Manufactures, &c. " To the person who shall invent and produce to the Society a cheap and portable drag, or other machine, superior to those now in use, for the purpose of taking up in the best and most expeditious manner, and with the least injury to, the bodies of persons who shall have sunk under water:" and accordingly I beg leave to submit to the inspection of the Society two models.

I have long, Sir, been discontented with the construction of the drags which have hitherto been in use, both in this and in other countries. Those used in Holland are not more than three or four inches in diameter, with very long and sharp points. They cannot therefore be properly applied to a naked body; and were not the Dutch sailors and boatmen, who are most exposed to danger, very thickly clad, they might be productive of mischief. I attempted, when resident in that country, to make some improvements, by turning the points obliquely inwards, so as to catch the clothes without penetrating deep into the body; but still these were only applicable in cases where the subject fell into the water in his clothes. The drag which is now used in London is, in many respects, exceptionable; it is clumsy and dangerous.

The design of establishing a Humane Society at Bath, induced me to reconsider the subject with more attention; and the result has been the construction of two drags, according to the models which are sent to you, at the desire of that Society. The consideration of economy has induced me to construct the drag, Fig. 2. as it may be made at about half the price of the other, and in some cases be equally useful. The drag, Fig. 1. is applicable to every case, and the only objection to it is its higher price.

You will perceive by the annexed drawing the object in view, which is to multiply the chances of laying secure hold of any part of the body, without the possibility of an injury. Had the dimensions been smaller than they are, the drag would not encompass every part of a human body; and without the partition and curvatures at the extremities, the distances would be too great, and the body of a child might fall through the intermediate spaces. By means of the sliding hooks at the ends, the instrument is adapted both to naked bodies, and those which are clothed. As bathers are naked, the sharp-pointed extremities might lacerate in a disagreeable though not a dangerous manner: or by entering the skin, they might impede a firmer hold. They are therefore made to recede.

But in accidents from skaiting, or in such where the subject falls into the water with his clothes on, the hooks will be of the utmost advantage, as the slightest hold will be sufficient to render the body buoyant.

The upper extremities are made both with a socket and a loop, a loop, by which they are accommodated either to a pole or a cord; or, which is still better, to both. In ponds or rivers, where accidents are most likely to happen, should they occur at a distance from the shore, no pole would be able to reach to a sufficient extent, unless the assistants were in a boat, which is not at all times at hand. In such cases a cord may be attached to the loop, and the instrument be thrown to the place where the body is supposed to lie. If the person exposed to danger should be able to swim a little, or in any way just support himself from sinking, he might possibly lay hold of the floating piece of wood connected with the lower end of the drag by means of a rope, and thus be brought to shore. This appendage answers another purpose. In rivers particularly, the limbs of the instrument may probably catch roots of trees, &c. and can only be disengaged by pulling the drag in a contrary direction by means of the floating wood and rope.

When I said that both pole and cord are preferable to either singly, it was for the following reason. I have found by experiments, that a cord tied to the ring or loop, and passing through a hole made at the upper end of the pole, gives a double advantage. The drag, with a pole attached to it, of not more than 10 or 12 feet in length, may be projected several yards further than without it; and in drawing forward the drag, till the end of the pole is brought within reach of the hand, the subject may be raised above the surface of the water in the most proper direction. But a pole of 15 or 16 feet in length is unwieldy, and would even float the drag unless it was made much heavier.

If a drag was wanted in those cases only, where it is not necessary to throw it to a distance, then Fig. 2. would answer every purpose. It is obvious that this requires a pole to be fixed in it, so that the hand may direct the projecting parts to the body, which otherwise could not always be done.

We have not as yet had an opportunity of trying these drags upon a human body; but upon an effigy made in every respect as like as possible in form to the human body, both clothed and unclothed, they have answered in the most satisfactory manner. The effigy was brought to the surface in various directions, without once slipping from the hold.

I shall just beg leave to add, that with two drags and a boat, assistance given in time would almost ensure success. A hook catching a single thread, it is well known, will be sufficient to bring a human body to the surface of the water, or till it becomes visible: a second drag at such time might be applied to any part of the body, so as to secure a firm hold.

The workman charges the triangular drag at one guinea, the other at 12 shillings. A pole 16 feet in length was charged three shillings. The fangs were estimated at one shilling and sixpence.

I am, Sir,
Your most humble Servant,
THOMAS COGAN.

Bath, March 1, 1806.
To C. TAYLOR, M. D.

Reference to the Engraving of Dr. Cogan's Drag. Plate IV, Fig. 1, 2, 3, and 4.

Fig. 1. A shews the drag complete, with two cords B and C attached to it; that at the top, B, is fastened to a ring at D; the bottom cord is tied to a hole in the iron at E. The six ends of the projecting branches have each a barbed claw, which can be slided forward or drawn back, as may be thought necessary. There is a hollow socket in the upper part of the drag at D, so as to admit the end of a pole to be screwed therein, whenever it may be thought useful.

Fig. 2.

Mr. A. Slaff's Machine for Shoemakers.

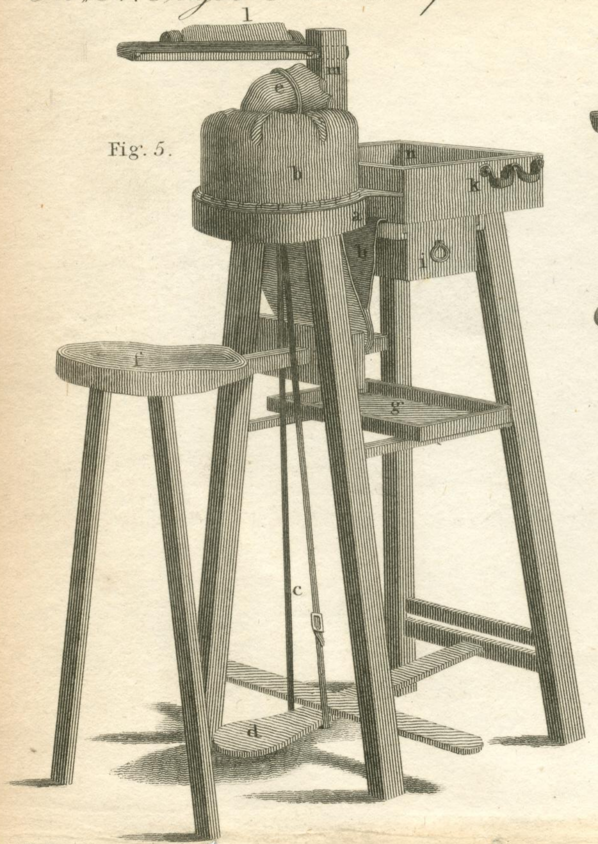


Fig. 5.

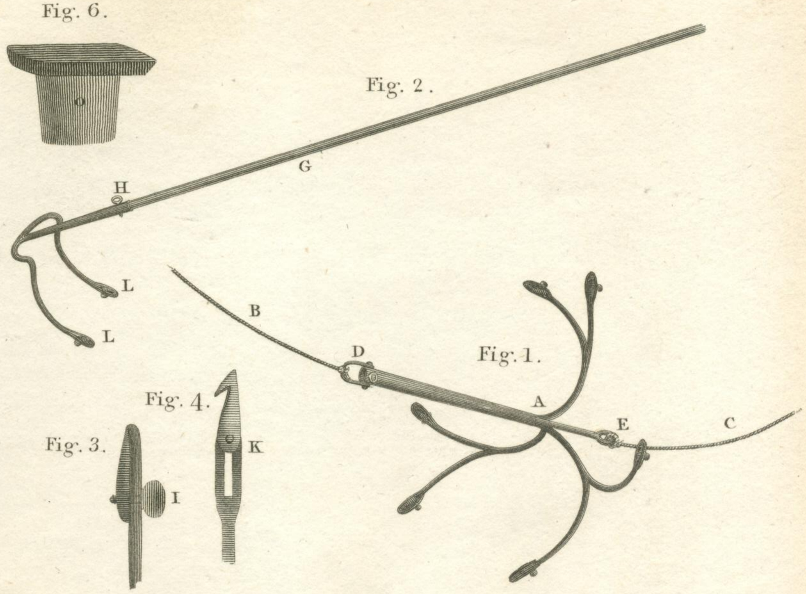


Fig. 6.

Fig. 2.

Fig. 1.

Fig. 4.

Fig. 3.

Dr. Cogan's Drags.

C. Varley del.

S. Porter sculp.

Fig. 2. Is the cheaper or more simple drag, and intended only to be used with a pole G, fastened in its hollow socket by the screw H, and to be used in the manner of a rake to bring the body to land. It has barbed claws at the extremities of its branches L L, moveable backwards and forwards, which claws slide in a groove made in the extremity of each branch.

Fig. 3. Shows one of the claws drawn upon a larger scale, screwed to one of the extremities of a branch. In this situation the screw head appears at I, on the outside of the branch, and the claw is within, and does not extend beyond the extremity of the branch.

Fig. 4. Shows the same barbed claw at its utmost extent, projecting beyond the extremity of the branch. The end of the worm of the screw, which holds it fast in that position, appears at K.

TEN GUINEAS *were this Session voted to* Mr. A. STASS, *No.* 18, *Porter Street, Newport Market, for a* MACHINE, *to enable Shoemakers to make* SHOES *or* BOOTS *without suffering that pressure upon the Stomach usual in that Trade.*

The following Communication was received from him; an ENGRAVING *is annexed, and one of the Machines is placed in the Society's Repository.*

SIR,

I BEG leave to offer for the consideration of the Society, a machine, by which the vocation of a numerous and hard-working class of men may be rendered less deleterious to their health, than it has been ever since they were considered a trade.

This machine is to be used by men when making shoes or closing boots, and is constructed to save them the disagreeable and hurtful posture they now use, by sitting in a cramped and painful situation; and it has been vouched for by physicians of the first abilities, that most of that particular class of labouring men die of asthma and consumption, occasioned by constant application in so unwholesome a posture.

This machine, simple in itself, is so constructed, that a man may stand to his work, sit, or recline in a half sitting posture, and without having constantly his work pressing against his breast or stomach. It is not awkward; but from the inspection of some of the first workmen in the trade, has been highly approved of in every respect, being not only useful, but of great comfort and convenience when compared with the method of working heretofore adopted.

I beg therefore to request the Society will allow me to submit it to their inspection, as I am anxious that my good intentions to my fellow-workmen may be generally known and adopted, and I know no better method than by receiving the approbation of so Honourable a Society.

I shall feel myself truly gratified if I may be so far honoured with their attention; and I beg to know when you will be pleased that I shall attend the committee, to explain its mechanism, and on that occasion I will work a boot or shoe on it in their presence.

I have the honour to be, Sir,
Your most obedient humble Servant,

A. STASS.

Porter Street, Newport Market,
May 16, 1805.

To C. Taylor, M. D.

Reference

Reference to Mr. Stass's Machine for Shoemakers. Plate IV. Fig. 5, 6.

Fig. 5. *a.* The bench standing on four legs about four feet from the ground.

b, A circular cushion affixed to the bench, in the centre of which cushion is a hole quite through the bench, through which a leather strap *c* is brought up from below. This strap holds the work and last firm upon the cushion, in any position required, by means of the workman's foot placed upon the treadle *d.*

e, Shows the last upon the cushion, with the strap holding it firm.

f, Is a seat for the workman to use occasionally; it is supported behind by two legs, and in the front by a cross piece of wood, into which a projecting arm extends from the seat, and allows the seat to be moved nearer or further from the work as may be required.

g, A shelf, on which the hammer may be laid.

h, A leather bag to contain the tools.

i, A drawer, to hold such articles as should be kept free from dust.

k, Leather slips to contain the cutting knives.

l, A whetstone, on which the knives are to be sharpened, and moveable on an upright pivot or axis *m.*

n, The upper part of the bench to hold the lap-stone, &c.

Fig. 6. The lap-stone. The conical part *o,* fits into the hole in the cushion *b,* so as to hold it firm, whilst the leather is beaten with a hammer.

The GOLD MEDAL *this Session was voted to* JOHN TROTTER, *Esq. of Soho Square, for his Invention of a* CURVILINEAR SAW.

The following Communication was received from him; and a Model of the Saw is preserved in the Society's Repository.

GENTLEMEN,

WITH the view of obviating many difficulties and expenses, which have long attended the operations of those requiring curvilinear sawing in their trade, and of public bodies connected with those trades, through the licentious and refractory conduct of sawyers, it has been represented to me as a measure extremely desirable, to adopt more generally mechanical powers, could such be discovered as would preclude much mystery and manual labour.

Considering the subject in a national point of view, as connected with our naval yards in the formation of timber; with our military departments, in respect to wheels of every description; with our whale and herring fisheries; our public and private breweries and distilleries; our East and West India Companies, and other bodies depending on cooperages, as well as other minor trades peculiarly liable to the evils complained of, I invented a curvilinear saw, which, with little aid of the most ignorant labourer, answers every purpose.

Having effected these ends, suffer me to solicit the honour of your acceptance of a model, together with a drawing of my saw, sufficiently accurate for the use of those in remote situations to work by, who may wish to use or make them.

I have the honour to be,
Gentlemen,
Your most obedient and most humble Servant,
JOHN TROTTER.

Soho Square, Sept. 12, 1805.

To the Society for the Encouragement
of Arts, &c.

Reference to the Engraving of Mr. Trotter's Curvilinear Saw. Plate V.

Fig. 1. Represents a bird's eye view of the saw and machinery. The dotted lines show the spindle *a*, moving on two centers *b*, *b*, having at one end a pulley *c*, and at the other a concave saw *d* (with a corresponding convexity to the curve required to be sawed,) secured on the convex side by a collar, and on the concave side by a loose collar, and screw nut.

e, *e*, Two grooved plates, admitting through the top of the bench and fence *f*, screw bolts fastened by thumb nuts, by means of which, and a parallel motion *g* the fence *f* is regulated, and consequently the conductor *h* of the wood *i*, admits it to be sawed through, as represented in the dotted line at any part required.

The fence, conductor, and saw, must all be curved alike; but to saw in smaller circles, with the same saw and at the same time square with the face of the bench, a steel slider *k*, regulated by two screws, is made to press, as occasion may require, on the convex side of the saw, and raise the vertical line of it to a right angle with the bench; otherwise the top of the bench itself must receive the same inclination to the vertical line of the fixed saw.

Fig. 2. Is a front view of the saw and bench, in which the teeth of the saw are more clearly shown.

Fig 3. An end view of the same machinery.

Fig. 4. Shows the saw, axle, and pulley, all made of iron or steel, and separated from the frame.

FIFTEEN GUINEAS *were this Session voted to* MR. JAMES HARDIE, *of Glasgow, for a* BOOKBINDER'S CUTTING PRESS.

An ENGRAVING *of the Machine is annexed, and a Machine is reserved in the Society's Repository.*

SIR,

I HAVE herewith sent a model of an improved press for bookbinders, the invention of Mr. James Hardie, bookbinder, Glasgow. The inventor claims no other merit than that of having simplified the common press, rendered it more powerful, and adapted it to work more economically; or, in other words, to save time to the workman. It has been found so superior to the press in common use, that all the bookbinders in Glasgow and Edinburgh are adopting it. This is perhaps the best proof that can be given of its utility. The inventor has received certificates from the bookbinders alluded to, which will be sent to the Society. if they think the press worthy of their notice. Mr. Hardie, in desiring me to submit the model to the inspection of the Society, has in view chiefly to benefit the bookbinders in places remote from his residence, an object which he thinks cannot be so well attained in any

Mr. J. Trotter's Curvelinear Saw.

Mr. J. Hardie's Book Binders Cutting Preſs.

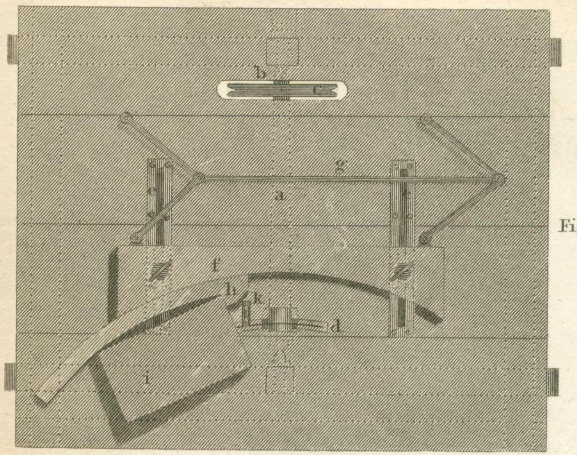
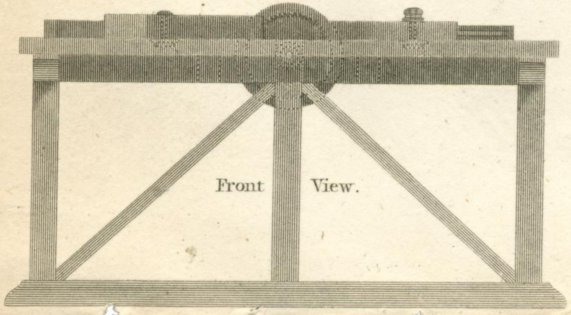


Fig. 1.

Fig: 2.



Front View.

Fig: 5.

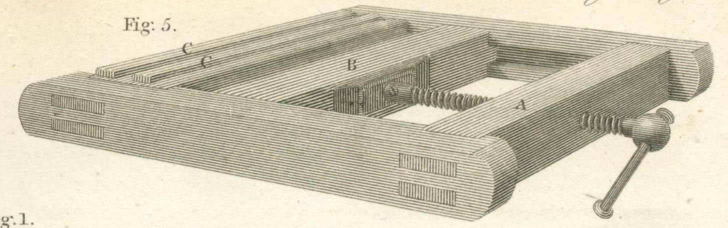
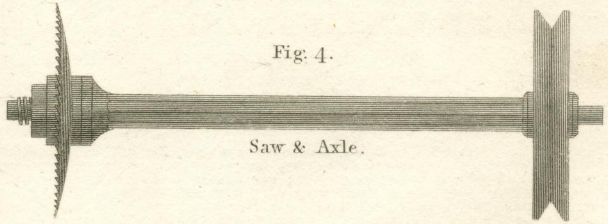
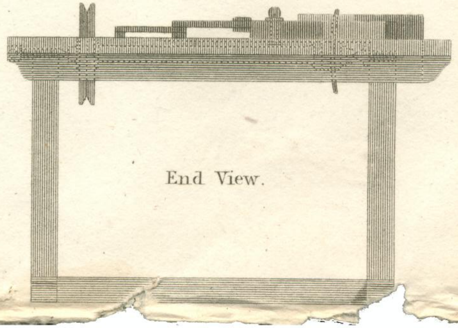


Fig: 4.



Saw & Axle.

Fig: 3.



End View.

any other way, as by the publicity which the Society is able to give to improvements deserving of its notice.

The improvement of this simple instrument has cost Mr. Hardie much time, and even expense; and he will be glad to receive any remuneration from the Society which they may think his invention deserves.

I am, Sir,
Your most humble Servant,
A. TILLOCH.

Carey Street, Feb. 21, 1806.
To C. Taylor, M. D.

Twenty-three persons testified by their signatures and subscriptions to Mr. Hardie their approbation of his Cutting Press.

The Society has received a Certificate from Lord Douglas, who very strongly recommends Mr. Hardie's press in preference to the one in common use.

Reference to the Engraving of Mr. J. Hardie's Bookbinder's Cutting Press. Plate V. Fig. 5.

The principal difference between this and the press which has been for time immemorial employed by the bookbinders, consists in effecting the business by one iron screw instead of two wooden ones formerly used. This screw works in a nut let into and screwed to the top piece A, its lower end working in a collar, screwed to the moving piece B, sliding in grooves within the two sides of the frame. C C are the guides for the plough, as in the common press.

The GOLD MEDAL, *or* FORTY GUINEAS, *at the Option of the Candidate, were this Session adjudged to* Mr. NEIL SNODGRASS, *of Johnstone, County of Renfrew, Scotland, for a* MODE *of* HEATING ROOMS *by* STEAM.

The following Accounts were received from him, and the pecuniary Reward paid to him at his desire.

An explanatory ENGRAVING *is annexed, and large* DRAWINGS, *upon an accurate Scale, may be seen at the Society's House.*

SIR,

THE undersigned memorialist having several years since invented, and successfully put in practice, a method of heating rooms, which he flatters himself will be found to fulfil the conditions for reward required by the Society, begs leave to propose himself as a candidate for the honour of such reward.

NEIL SNODGRASS.

Johnstone, Feb. 18, 1805.
To C. TAYLOR, M. D.

Reference to the Engravings, Plate VI. *of Mr. Snodgrass's Method of Heating Rooms by Steam.*

THE proposed mode of heating rooms will, perhaps, be most distinctly explained by a brief history of the first ideas of the memorialist on the subject; of his attempts to put them into practice; and of the successive improvements which have been suggested to him by experience.

In April 1798 he was engaged by G. Macintosh and David Dale, Esqrs. to manage a cotton mill near Dornoch, in the county of Sutherland. He remained in Glasgow for six months after this, superintending the construction of machinery for the mill. During this period he was led to consider of a cheap method of heating the mill, as he had learnt that fuel was extremely scarce and dear in the country in which the mill was situated. It was evident that none of the methods which he had seen practised could be applied, but at an enormous expense; and his experience had pointed out to him important defects and inconveniences in them all. Having observed a mode of drying muslins by wrapping them round hollow metal cylinders, filled with steam, practised at the bleach-fields near Glasgow, it occurred to him, that by means of a proper apparatus, steam might be applied to heat a cotton mill, or any other large manufactory. It was evident that this not only would be an economical mode of producing heat in large works, so far as fuel was concerned, but that it would prevent the danger of fire, to which such works, when heated in the usual manner, are much exposed. He communicated his notions to a number of cotton spinners and others, from whose suggestions he expected assistance. But he met with nothing but discouragement, the project being every where treated lightly, or pronounced to be impracticable. Strongly impressed, however, with the advantages of the plan, the memorialist persevered in his resolution to make trial of it, and ordered tin pipes to be made for the purpose. These he erected in the mill in May 1799. When filled with steam they at once produced the necessary degree of heat; but the pipes, having been damaged in the carriage, proved not sufficiently strong. Indeed the memorialist was immediately sensible, that their position was unfavourable. With a view to some conveniences in point of room, they had been carried up diagonally in one end of the mill, whence the upper sides of the pipes became sooner heated than the lower, which caused an unequal expansion. The water arising from the steam condensed in the pipes in its return to the boiler, and also obstructed the steam in its ascent. In order to remedy these defects the pipes were altered, and erected in a perpendicular position, and certain tubes were connected with them, to carry off the water arising from condensation. The whole apparatus, as it stood after this alteration, is represented by the drawing, Fig. 1.

This drawing presents a view of an inner gable, which is at one extremity of the preparation and spinning rooms of the mill. On the other side of this gable there is a space of 17 feet enclosed by an outer gable, and containing the water wheel, the staircase and small rooms, for the accommodation of the work. In this space the furnace and boiler are placed on the ground. The boiler cannot be shown here, as it lies behind the gable exhibited; nor is it of any consequence, as there is nothing peculiar in it. It may be of any convenient form. The feeding apparatus, &c. are in every respect the same as in the boiler of a common steam engine. A circular copper boiler, two feet diameter, by two feet deep, containing 30 gallons of water, with a large copper head, as a reservoir for the steam, was found to answer in the present instance. The steam is conveyed from the boiler through the gable, by the copper pipe B, into the tin pipe C, C. From C it passes into the centres of the perpendicular pipes E, E, E, by the small bent copper tubes D, D, D. The pipes E, E, E, are connected under the garret floor by the tubes F, F, for the more easy circulation of the steam. The middle pipe E is carried through the garret floor, and communicates with a lying pipe 36 feet in length (the end of which is seen at G,) for heating the garret. At the farther extremity of the pipe G, there is a valve falling inwards to prevent a vacuum being formed on the cooling of the apparatus; the consequence of which would be the crushing of the pipes by the pressure of the atmosphere. Similar valves, K, K, are placed near the top of the perpendicular pipes E, E; and from the middle one E, the small pipe passes through the roof, and is furnished with a valve at I, opening outwards, to suffer the air to escape while the pipes are filling with steam, or the steam itself to escape when the charge is too high.

The water condensed in the perpendicular pipes E, E, E, trickles down their sides into the three funnels L, L, L, the necks of which may either pass through, or round, the pipe C, into the copper tube M, M, which also receives the water condensed in C, C, by means of the short tubes N, N. The pipe C, C, is itself so much inclined as to cause the water to run along it to the tubes N, N, and the pipe G in the garret has an inclination of 18 inches in its length, to bring the water condensed in it back to the middle pipe E. The tube M, M, carries back the water through the gable to the boiler, which stands five feet lower than this tube. It is material to return the water to the boiler, as, being nearly at a boiling heat, a considerable expence of fuel is thereby saved.

The large pipes are ten inches in diameter, and are made of the second kind of tinned iron plates. The dimensions of the smaller tubes are seen by their comparative size in the drawing, and perhaps they might be varied without inconvenience.

The apparatus erected as here described, has been found sufficiently strong, and has required no material repairs since the first alterations were made. The leading object in the instance under consideration being to save fuel, in order to derive as much heat as possible from a given quantity of fuel, the flue from the furnace, which heats the

boiler,

boiler, is conveyed into common stone pipes placed in the gable. These are erected so as to prevent any danger of fire, in the manner shown in the drawing, Fig. 2. The steam with this auxiliary communicates a heat of about 70° to the mill, the rooms of which are 50 feet long, 32½ feet wide, and 8½ feet high, except the lower story and garret; the former of which is 11, and the latter 7 feet high. The rooms warmed in this manner are much more wholesome and agreeable than those heated by the best constructed stoves, being perfectly free from vapour or contaminated air.

By various experiments it appears, that the expense of fuel is scarcely one half of what is necessary to produce the same degree of heat with the best constructed stoves. The memorialist was the better able to make the comparison, since he had previously had five years experience of cotton mills on what was, at that time, reckoned the most approved plan.

After having ascertained these results, the memorialist, in 1800, drew a plan similar to that now presented to the Society, and sent it to Glasgow to his employers, who were very doubtful of the success of the scheme. They immediately published the discovery in the Glasgow newspapers, inviting cotton spinners, and others interested, to inspect the plan. In consequence of this public intimation of the method having been successfully practised, a number of cotton spinners turned their attention to it, and adopted it with various modifications, according to the convenience of their mills, or their notions of improvement.

The memorialist afforded to every person who desired it, all the information on the subject which he possessed. His general recommendations were to detach the condensed water, in returning it to the boiler, as much as possible from

Mr. N. Snodgrass's methods of heating Rooms by Steam.

Fig. 2.

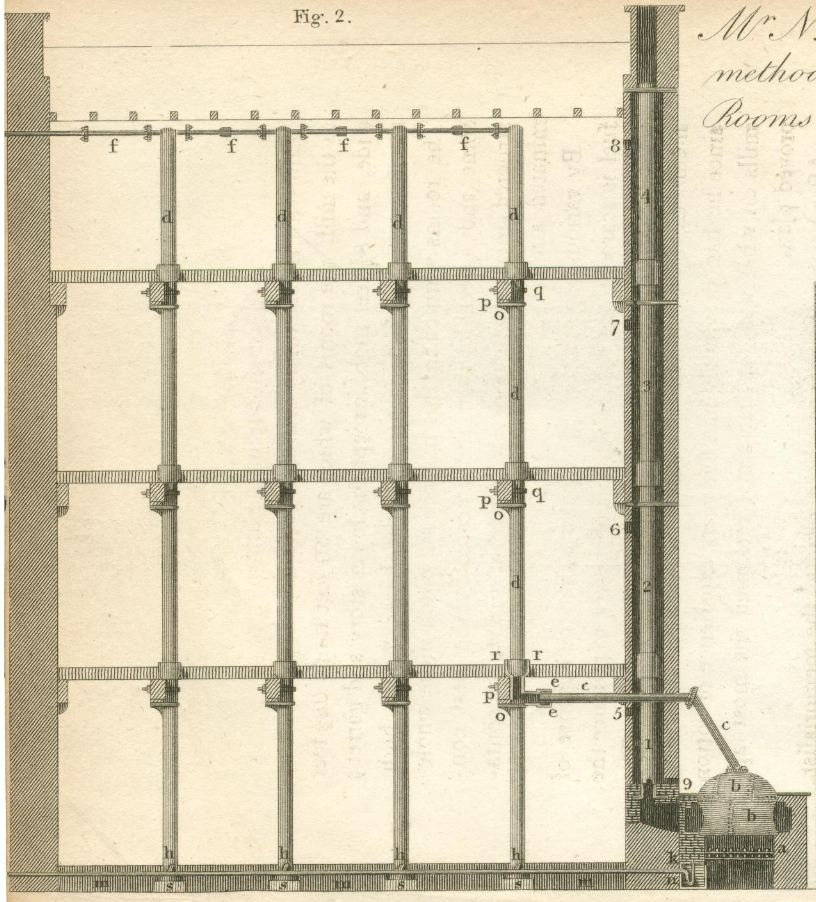
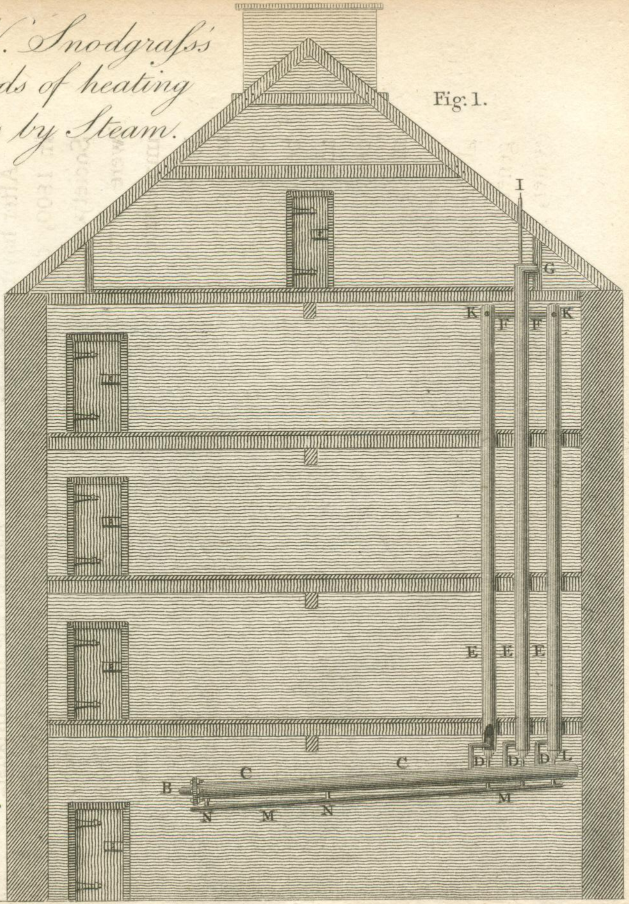


Fig. 1.



Varley del.

Porter sculp.

from the steam; and where tin pipes, or others of similar strength, were used, to secure them carefully with safety valves.

There are obvious defects in the application of the principle, as practised in the instance described above. Of some of these the memorialist was perfectly aware at the time of the first construction of the apparatus, though it was out of his power to remedy them; and he has thought it proper to give a detail of the first successful experiment exactly as it took place.

From the pipes being all in one end of the house, the heat was unequally diffused, and a considerable time elapsed, after their being first heated, before it reached the other end of the rooms. But, as the mill had barely room enough for the spinning machinery, it was impossible to erect the pipes in any other situation, or to convey them along the rooms, so as to produce a more equal distribution of heat. This, however, can be so easily effected, when there are no obstacles, such as have been mentioned, that it is scarcely necessary to enter into any detail of the means. It may be barely mentioned that the memorialist has fitted up the apparatus in two cotton mills, which are now under his management, belonging to George Houston, Esq. and Co. of Johnstone, in a manner which completely distributes the heat. In one of these mills, consisting of six stories, a lying pipe of cast iron, 5 inches in diameter, is carried along the middle of the lower story, about two feet from the ceiling, with a small declivity to carry off the water. This pipe heats the story in which it is placed. Tin pipes, 7½ inches diameter, communicating with this lying pipe, are carried up perpendicularly through all the floors to the top of the house at the distance of seven feet from each other, and form a line of heated columns in the middle of each room.—The same general plan has been followed in the other mill. But there are several irregularities in the building, which require a little variation of the contrivances for diffusing the heat to every quarter. Some of the rooms having been added since the first erection of the mill, are connected with the main body of the building awkwardly. Into these the steam is carried by lying pipes, slightly inclined, and communicating with the principal apparatus. The steam may afterwards be distributed by other pipes in any way that is thought convenient. The memorialist has found no difficulty in conveying, by such means, the steam necessary to produce the degree of heat required in every variety of situation.

In the former of the last mentioned mills, the perpendicular pipes are connected under the ceiling of the garret by a pipe 2½ inches diameter, slightly inclined, the extremities of which pass through the walls of the house, and are provided with valves opening outwards. A connecting pipe, with similar valves, is placed under the ceiling of the third story. These are intended for the more easy circulation of the steam: but the memorialist found, from experience, that with all these aids, the filling of the perpendicular pipes with steam was attended with some difficulty. The steam, when first thrown in, passes up the perpendicular pipe nearest to the boiler, and, being specifically lighter than air, occupies the upper part of the apparatus, compressing the air in the lower part of the rest of the pipes. The resistance of the air will thus for a long time prevent the pipes from being completely heated: but this difficulty is easily obviated by having a valve or valves opening outwards, at the lowest part of the apparatus, through which the air, when compressed by the steam, is suffered to escape. In the mill just mentioned, the lying cast iron pipe in the first story is carried through the gables of the mill, and furnished with valves for the egress of the air. It is unnecessary to repeat, that the same valves serve for the discharge of the air in heating the apparatus, and of the steam itself, when its expansive force becomes too great. In both mills each of the perpendicular pipes is provided with a valve, to prevent a vacuum; and in the second mill the lying pipes for carrying the steam into the detached rooms have each two valves, one opening inwards, and the other outwards.

Certificates of five other mills being heated in a similar manner, by the direction of the memorialist, are presented to the Society.

The application of the principle to buildings already constructed, it is presumed, will be sufficiently obvious from the foregoing details. In new manufactories, where the mode of heating may be made a part of the original plan, a more convenient apparatus may be introduced. This will be best explained by a description of the drawing, Fig. 2. which gives a section of a cotton mill constructed in a manner which the memorialist would adopt, were he to apply the steam apparatus to a new building, or any other that would permit such an apparatus from its regular constructions. In an old mill in this place, an apparatus is now erecting by the advice of the memorialist, conformable to this plan, which is likely to be generally adopted in new cotton mills.

The furnace for the boiler is shown at *a*. The flue of the furnace conveys the smoke into the cast iron stove pipes, 1, 2, 3, 4. These pipes are placed in a space in the gable, intirely enclosed with brick, except at the small apertures, 5, 6, 7, 8. A current of air is admitted below at 9, and thrown into the rooms by those openings, after being heated by contact with the pipes. This part of the plan is adopted with a view to prevent, as much as possible, any of the heat, produced by the fuel used, from being thrown away: It may be omitted where any danger of fire is apprehended from it, and the smoke may be carried off in any way that is considered absolutely secure. So far, however, as the memorialist is able to judge, there seems to be little or no danger of fire from a stove of this construction. The greatest inconvenience of a common stove is, that the cockle or metal furnace is liable to crack from the intensity of the heat. By the continuity of the metal from the fire-place, an intense heat is also conducted along the pipes, which exposes them to the same accident. Here the smoke being previously conveyed through a brick flue, can never communicate to the pipes a degree of heat sufficient to crack them. In like manner the pipes, having no communication with the rooms but by the small apertures, cannot come in contact with any combustible substance; and from being surrounded with air, which is constantly changing, can impart only a very moderate degree of heat to the walls. The iron supporters of the pipes may be imbedded in some substance which is a bad conductor of heat, as furnace ashes and lime, &c. The emission of heated air into the rooms may be regulated by valves. As the pipes are not exposed to cracking, there is no risk of their throwing smoke or vapour into the rooms.

The boiler *b*, *b*, is six feet long, three and a half broad, and three feet deep. As there is nothing peculiar in the feeding apparatus, it is omitted. The boiler may be placed in any convenient situation. Where a steam engine is used for other purposes, the steam may be taken from its boiler. The pipe *c*, *c*, conveys the steam from the boiler to the first perpendicular pipe *d*, *a*, *d*. There is an expanding joint at *e*, stuffed, to make it steam tight. The steam ascending in the first pipe *d*,*d*,*d*, enters the horizontal pipe *f*,*f*,*f*,*f*, (which is slightly inclined) expelling the air, which partly escapes by the valve *g*, and is partly forced into the other pipes. The valve *g* being considerably loaded, forces the accumulating steam down into the rest of the pipes *d, d, d*. The air in these pipes recedes before the steam, and is forced through the tubes *h, h, h,* into the pipe *m, m, m,* whence it escapes at the valve *i,* and the syphon *k*. The water, condensed in the whole of the pipes, passes also through the tubes *h, h, k, h,* into the pipe *m, m, m,* which has such a declivity as to discharge the water at the syphon *k,* into the hot well *n,* whence it is pumped back into the boiler.

The whole of the pipes are of cast iron, except *m, m, m,* which is of copper. The perpendicular pipes serve as pillars for supporting the beams of the house, by means of the projecting pieces *o, o, o,* which may be raised or lowered at pleasure by the wedges *p, p, p*. The pipes are sunk in the beams about an inch, and are made fast to them by the iron straps *q, q*. Those in the lower story rest on the stones *s, s, s, s,* and are made tight at the junction with stuffing. The pipe in each story supports the one in the story above by a stuffed joint as shown at *r*. The pipes in the lower story are seven inches in diameter; those in the higher six inches; those in the other two are of intermediate diameters. The thickness of the metal is $\frac{3}{8}$ of an inch. The lower pipes are made larger than the upper, in order to expose a greater heated surface in the lower rooms, because the steam being thrown from above into all the pipes, except the first, would otherwise become incapable of imparting an equal heat as it descends.

There is no necessity for valves opening inwards in this apparatus, the pipes being strong enough to resist the pressure of the atmosphere.

The cotton mill is 60 feet long, 33 wide, and four stories high, the upper being a garret story. In the engraving five parts out of nine in the length of the building are only shown. The apparatus will heat the rooms to 85° in the coldest season. It is evident that, by increasing the size, or the number of the pipes, and the supply of steam, any degree of heat up to 212° may be easily produced. It may even be carried beyond that point by an apparatus strong enough to compress the steam; this, however, can seldom be wanted. At first it was objected to this construction, that the expansion of the pipes, when heated, might damage the building; but experience has proved, that the expansion occasioned by the heat of steam is quite insensible.

The memorialist thinks it would be improper, in addressing so intelligent a body as the Society of Arts, &c. to expatiate on the various economical purposes to which the principle, which he has been able but imperfectly to unfold, may be applied. In abler hands it may be found susceptible of improvement, which he cannot anticipate.

NEIL SNODGRASS.

Certificates from Mr. GEORGE MACINTOSH, and Messrs. HENRY MONTEITH, BOGLE and Co. of Glasgow; Mr. GEORGE HOUSTON, Messrs. ROBERT HODGART and Co. Messrs, JOHN FIFE and Co. and Mr. JOHN M'NAUGHT, of Johnstone; Mr. JAMES BOYLE, manager for Messrs. M'FARLAM, BLACK and Co. at Gryse-Mill; also from Mr. WILLIAM KERR, for the Lochwinnoch Spinning Company, confirm the utility and success of Mr. SNODGRASS's method, and attribute to him the credit of first applying steam to the purpose of heating manufactories.

Mr. G. Field's Stove for heating or Drying.

Fig. 1.

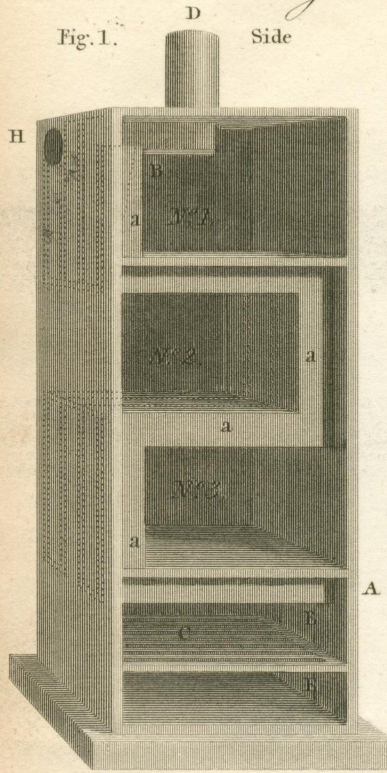


Fig. 2.

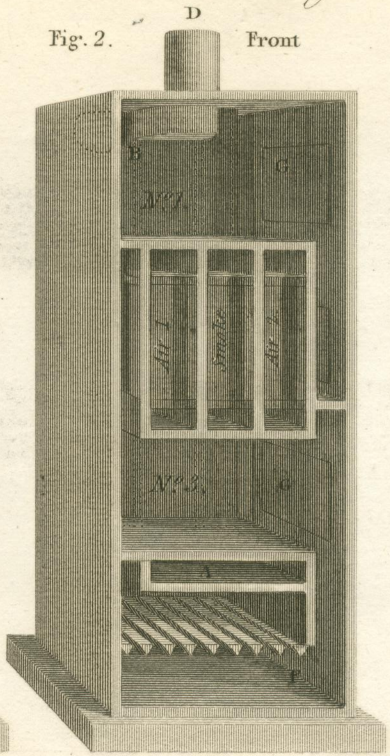
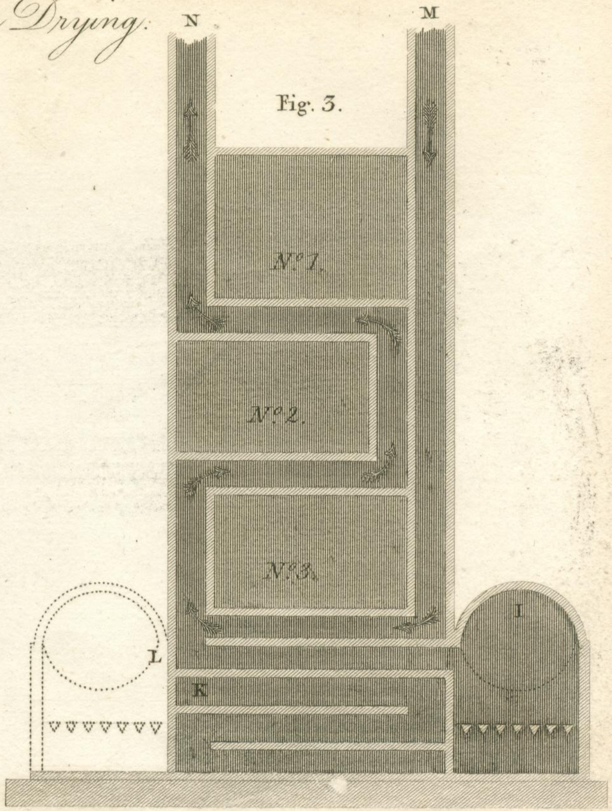


Fig. 3.



Varley del.

The SILVER MEDAL *was this Session voted to* Mr. G. FIELD, *of Newman Street, for a* STOVE, *for* HEATING ROOMS, *or* DRYING DIFFERENT ARTICLES.

The following Communication was received from him; an explanatory ENGRAVING *is annexed; and a* MODEL *upon this Principle is preserved in the Society's House.*

SIR,

I HAVE the honour of enclosing a plan and account of a stove, which unites the various advantages of heating, boiling, steaming, evaporating, drying, ventilating, &c. These, together with a certificate and model of the stove, I beg the favour of you to lay before the Society.

I have the honour to be,
Your most obedient servant,
GEO. FIELD.

No. 87, *Newman Street, March* 11, 1806.
To Dr. C. TAYLOR,
Secretary, &c.

Description of the Stove.—Plate VII. Fig. 1, 2, 3.

Fig. 1. Represents a longitudinal section of the stove, showing the course of the air from its entrance into the flues of the stove at A, to its entrance into the upper chamber of the stove at B: and also the course of the smoke from the fire-place at C, till it escapes from the stove at D. E, E, are the doors or openings of the fire-place and ash-hole.

Fig. 2. Is a similar section at right angles with the above, exhibiting the course of the air through the chambers of the stove, from its entrance into the chamber No. 1.

at B to its entrance beneath the fire-place at F. This figure also shows sections of the flues, with the divisions through which the air and smoke pass separately, the smoke flue in the centre, and the air flues on each side. G, G, are doors and openings through which the articles to be dried are introduced into the chambers.

When the fire is lighted, and the doors of the chambers, ash-hole, and fire-place, closed, the air by which the fire is supplied enters at A, Fig. 1, passes through the air-flues *a*, *a*, *a*, *a*, enters the upper chamber at B, traverses and descends through the chambers No. 1, 2, 3, and arrives beneath the fire at F, Fig. 2. Having supplied the fire with oxygen, it passes through the flue with the smoke, and escapes at D, heating in its protracted course the chambers and air-flues.

As the cold air enters the stove at A, immediately above a plate forming the top of the fire-place, and pursues a similar route with the fire-flue, it enters the chambers very much heated and rarefied. Hence any moist substance placed in the chambers evaporates in consequence, not only of the heated flues circulating round them, but of a stream of warm rarefied air, which, while it continually raises evaporation, as continually bears away the exhaled moisture in its passage to the fire, thus imitating the gradual and efficacious plan of nature in drying by the sun and air. While these effects are taking place within the stove, part of the air which enters at A, Fig. 1 and 2, passes through air-flues on the other side of the fire-flue, pursues a parallel course with the first, and gives out a current of warm air to the room at an aperture H. This effect may be obtained in a much higher degree, if the doors of the chambers and ash-hole are opened: should the hand or face be then brought near, they would be fanned with a stream of warm air, especially from the upper chamber.

By means of this stove I have evaporated milk to dryness, without burning or discolouring it ; and have dried cherries, plums, and other fruits, so as to imitate those which are received from abroad. I have repeatedly dried colours and the most delicate substances without the slightest injury to them, even though the operation proceeded quickly,

The height of the stove is about 5½ feet; its diameter 2½ feet, and that of the flues 4 inches. The external part is constructed of brick, and the internal parts of thin Ryegate or fire-stone, except the top of the fire-place, which is a plate of cast-iron. Were it to be wholly formed of iron, its effects would necessarily be more powerful.

Fig. 3. Represents an extension of the plan, in which stoves of this kind may be advantageously connected with one or more furnaces for chemical or other uses. The fire-place, brought out, either in front or on one side, by the present position of its crown I, forms a reverberatory furnace, or will make a sand-bath by reversing it.

The space occupied by the fire-place in Fig. 1, may in this be converted into apartments for evaporating substances, or occasionally for cooling them by an opening at K to admit cold air, while the warm air of the stove is excluded by a register or door. The dotted lines show the manner in which a second furnace may be connected by an opening into the flue at L.

In addition to the uses already pointed out, this stove would probably be found extremely serviceable in drying japanners' goods, and consuming the noxious fumes and gas which arise from the oil and varnish used in this business.

Since the stove is not limited to any certain dimensions, it might be adapted to the drying of malt and hops, perhaps of herbs, corn, and seeds generally. It might also be accommodated to the purposes of the sugar-bakers, connected with the great fires they employ for their boilers. It has been shown to be useful in the confectioners art, and probably it may be equally so in baking biscuits for the navy; nor less so in drying linen for the laundress, dyer, calico-printer, and bleacher. I have myself found it well accommodated for a chemical elaboratory.

The efficacy of the stove in ventilating, boiling, and steaming may easily be shown. In manufactories and rooms generally, the heated and noxious part of the atmosphere ascends towards the ceiling: if then the air-flue M, Fig. 3, is continued upward according to the height of the room in which it is placed, the air will be drawn from the top, and the room become ventilated, while from the opening at N it is supplied, if requisite, with warm air.

It is unnecessary to show the various ways in which a boiler may be connected, with this plan: it is sufficient to observe, that in the space allotted for the fire-place in Fig. 1, there is sufficient room within the body of the stove for this purpose; and that if the circulating air be made to pass over the boiler, evaporation may be carried on very expeditiously by the air removing the vapour as it arises. Finally, if another division of the flues be made in the manner shown Fig. 2, it might form a steam-pipe or flue, running the course of the air and fire-flues to convey steam to one or more apartments of the stove; or extended beyond the stove for heating the room in which it stands. One of the air-flues might occasionally be adapted to this use. It is obvious that the power of steam in a heated apartment, would be not only greater, but better kept up. In steaming it would be necessary to close the apartments of the stove, and to give air to the fuel by a different course.

As the stove is not confined in its dimensions, so neither is it necessarily of the form described in the drawing, nor are the apartments necessarily three: all these particulars admit of variation according to local or other circumstances. It is evident that the air-flues themselves may be converted into chambers for drying, &c.; and the fire-place of Fig. 3 is well adapted to receive an apparatus for the decomposition of coal, &c.; for producing all the effects of the thermo-lamp, or illuminated smoke, &c. But it is needless to enumerate the many economical and philosophical uses to which the stove may be applied. It is sufficient for the present purpose if I have rendered the principle and plan intelligible, the artist and manufacturer will then be at no loss in adapting it to the particular object, which he may require it to accomplish.

A Certificate from Mr. S. Sellers, Chemist, Broad-Street, Bloomsbury, accompanied this communication, stating that the effects of the stove in question, are as Mr. Field has described them in his paper addressed to the Society.

Twenty Guineas *were voted this Session to* Mr. Benj. Stott, *of Bermondsey Street, for his Invention of a* Machine *for* Splitting Sheep-Skins.

The following Communication was received from him; and a Model of the Machine is preserved in the Society's Repository.

GENTLEMEN,

I have invented an engine for the purpose of splitting sheep-skins, that is, of making two good skins out of one. The former and common mode of dressing skins, is to shave one side off, reserving the shavings for glue pieces; whereas by my method, these shavings are all taken off in one piece, forming a good skin of leather; and thus, independently of the advantage arising to the proprietor, an additional revenue will be caused to the nation, in proportion to the increase of leather made.

I am, Gentlemen,
Your most obedient humble Servant,
BENJ. STOTT,
At Mr. Wm. ELLIS's, the Sign
of the Plough, Fryers'-Gateway,
Bermondsey Street, Borough.

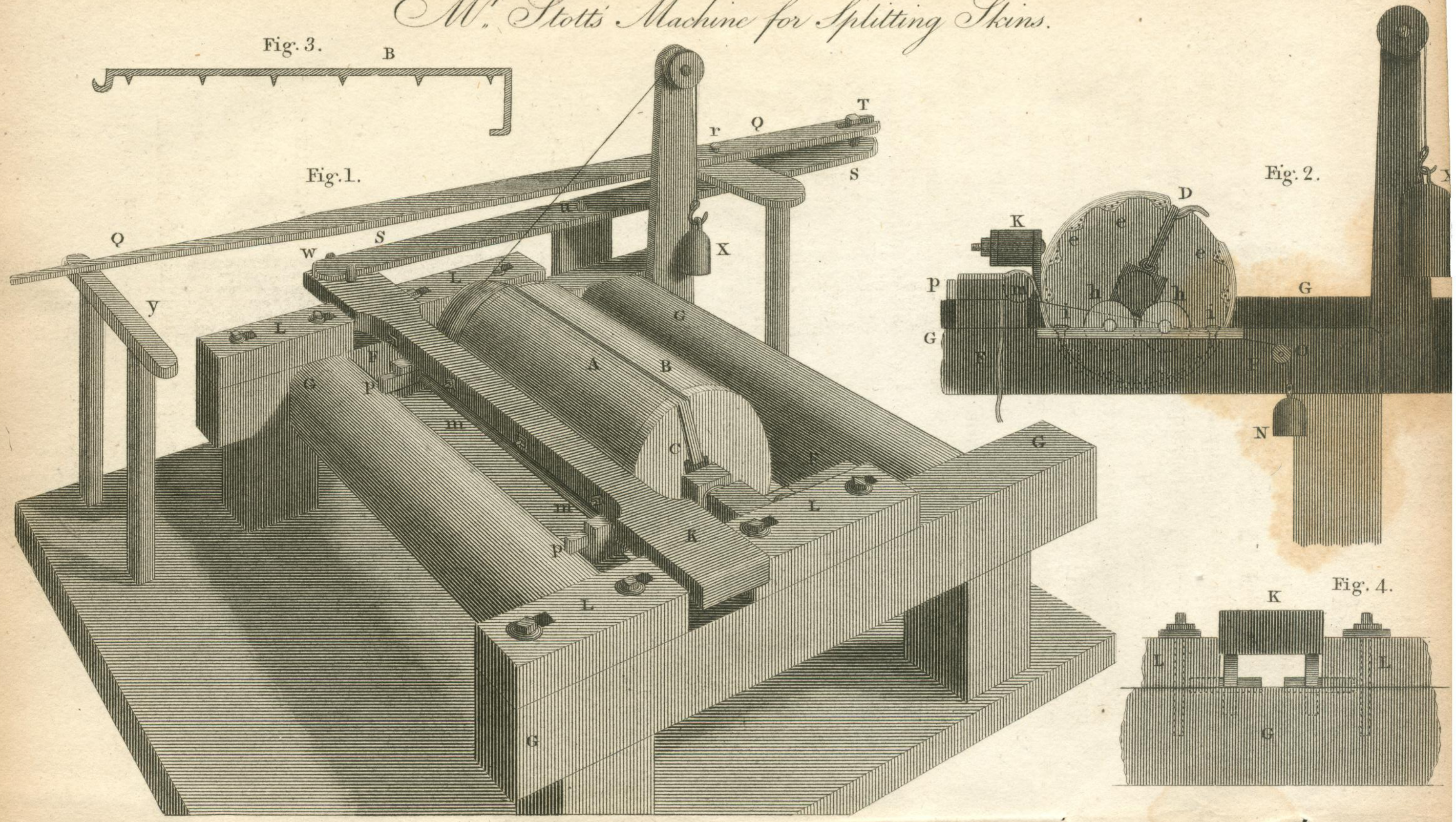
January 18, 1806.
To Dr. C. TAYLOR.

Reference to the Engraving of Mr. Stott's Method of Splitting Sheep-Skins. Plate VIII. Fig. 1, 2, 3, 4.

Fig. 1. A, the barrel of cast-iron (having wooden ends) round which barrel the skin is wrapped, and kept close by means of pins run through the edges into the wood, as at *e*, *e*, Fig. 2. B, (Fig. 1) an iron running in a groove along the barrel, catching in a hole at *c*, and fastened down at the other end by a hook fixed in the end of the barrel, the bar having points in it (as shown at B, Fig. 3,) under which the edges of the skin are fastened (as seen at D, Fig. 2). F, F, (Fig. 1 and 2) bars fixed across each end of the strong wooden frame G, G, G, G, over which the barrel is supported on friction-rollers, as at *h*, *h*, (Fig. 2) which run on a slip of brass, moveable under the screws *i*, *i*, to adjust the barrel to the knife. K, K, (Fig. 1 and 2) a strong bar of cast iron, to which the knife is screwed, moving lengthwise on friction-rollers between the pieces of wood L, L, L, L, on the frame G, as at K, (Fig. 4). The pieces of wood L, L, L, L, are each moveable under two screws,

Pl. V

Mr. Stott's Machine for Splitting Skins.



C. Varley del.

S. Porter sc.

screws, by which they are adjusted to steady the motion of the knife-bar. M, M, (Fig. 1 and 2) is a roller at the back of the knife, to which it is kept close by a weight N, at each end, acting over pulleys, as at O, (Fig. 2) suspended from the slider *p*, between which the roller is placed; by drawing the spare skin over this roller, as it is cut off, it keeps both sides of the skin equally up to the knife, and makes it cut more uniform. Q, Q, is a lever acting on a pin *r*, and moving another lever S, S, by means of a pin and a notch *t*, which acts on another pin at *u*; and by means of the two pins at W it moves the knife lengthwise to and fro: as fast as the skin is cut the barrel is drawn round by the weight X. *y* is a guide to the lever, from which end it is worked.

The Honorary SILVER MEDAL *was this Session voted to Mr.* JOHN MIDDLETON, *of St. Martin's Lane, for Improvements in* PRINTING PAPER-HANGINGS.

The following Communication was received from him.

SIR,

HAVING invented a machine for the purpose of printing Paper-Hangings, by which the printer works with greater facility and dispatch than in the usual way; and the tereboy, who could with great difficulty serve one sieve, can, by means of this invention, serve two with ease to himself; I should be glad to submit it to the inspection of any committee, which the Society may nominate.

I am, Sir, respectfully,
Your obedient and humble Servant,
JOHN MIDDLETON.

St. Martin's Lane, Jan. 29, 1806.
To Dr. C. TAYLOR, Sec.

Reference to Mr. Middleton's Apparatus for facilitating the Operations in Paper-Staining. Plate IX. Fig. 1, 2.

Method of Printing Light Grounds.

Fig. 1. A, the printer's table covered with a soft blanket. B, the woollen-cloth sieve on which the colour is laid and spread by a boy (called the Tere-boy) with a hair-brush. This cloth sieve is laid upon a leather sieve impervious to wet, and it floats upon some gum-liquor, in a wooden vessel C.

D, D, two cords 36 feet long, stretched from the table A to the other end of the room, and are kept tight by a weight at B.

F, F, an endless cord, passing round a grooved wheel G under the table, over a pulley H, in the side of the table, and over another I, at the other end of the room. Its use is to carry the cross-piece K, called the Traverse, which is fastened to it.

L, a wheel fixed on the same axis as the wheel G, but on the outside of the boarding of the table; it has three pegs projecting about four inches from its face. This wheel is moved by the printer setting his foot on one of the pegs.

Fig. 2. Is the traverse on a larger scale. M, M, are two pieces of wood connected by a hinge at N, and when closed are retained in that position by a ring O, put over the ends of them: it is connected with the endless cord, by a staple P on one side, and another staple on the other side, and slides along the cords D, D, by means of two pulleys R, R.

The operation of printing commences by putting one end of the paper to be printed (which is 12 yards long and 23 inches wide) between the divisions of the traverse (Fig. 2), and fastening it there by the ring O. The other part of the paper, except what lies on the printing-table, is wound round the roller S. The workman takes up the printing-block with his right hand, dips the face of it on the woollen cloth in the sieve, which the tere-boy had previously spread with colour, and then places the block upon the paper to be printed, giving it two or three smart strokes with a leaden mall held in his left hand; he then removes the block to supply it with more colour from the sieve; and during this operation sets his left foot upon the peg in the wheel; and as he recovers his upright position to bring the block over the table, his foot presses the peg down into the position 2, which, by means of the wheel G, endless cord F, and traverse K, draws the paper forward on the table just the proper distance to print again. When the whole piece is printed, the tere-boy goes to the end of the room, loosens the paper from the traverse, and hangs it up to dry in folds, on loose sticks placed across racks attached to the ceiling.

Method of Printing Dark Grounds.

The table and sieve for the colour are the same as in printing light grounds. The difference of printing consists in applying the colour from the block upon the table, by means of a lever, instead of striking the block with a mall; the pressure of the lever forcing a greater quantity of colour upon the paper and in a more even manner.

T, the axle of the lever. Y, the arm (15 inches long) to which the power is applied by means of a rope U, fastened to it, which has a treadle W at its end, for the workman to place his foot upon. X, another arm (six inches long) to which is jointed Y, a long pole, whose end is applied to the back of the block 3, when the pressure is given.

Z, an arm on the other side of the axle T, to which a weight is hung to balance the pole Y.

Fig. 3, Shows a section of the axle T with the arms V and Z projecting from it, and the manner in which the arm X is connected by a joint with the pole Y; the excellence of this principle depends upon the very great increase of power, which is given by bringing the pole nearer the centre of the joint or axis.

The paper being placed upon the table as in printing light grounds, and the workman having placed his block, furnished with colour, upon the paper to be printed, he puts his foot on the treadle W, attached to the cord U, takes the pole from behind the piece of wood 4, and applies its end upon the block U, and pressing down his foot makes the impression from the block upon the paper. He then lodges the pole behind the piece of wood 4, to be out of the way; he next removes the block to furnish it again with colour, and draws the paper forward for another impression, by the foot-wheel L, as described in the former mode.

TEN GUINEAS *were this Session voted to Mr.* JOSEPH DAVIS, *No.* 14, *Crescent, Kingsland-Road, for his Improvement in the* PAINTERS *and* GLAZIERS MACHINE.

The following Communication was received from him, and a MODEL *is reserved in the Society's Repository.*

SIR,

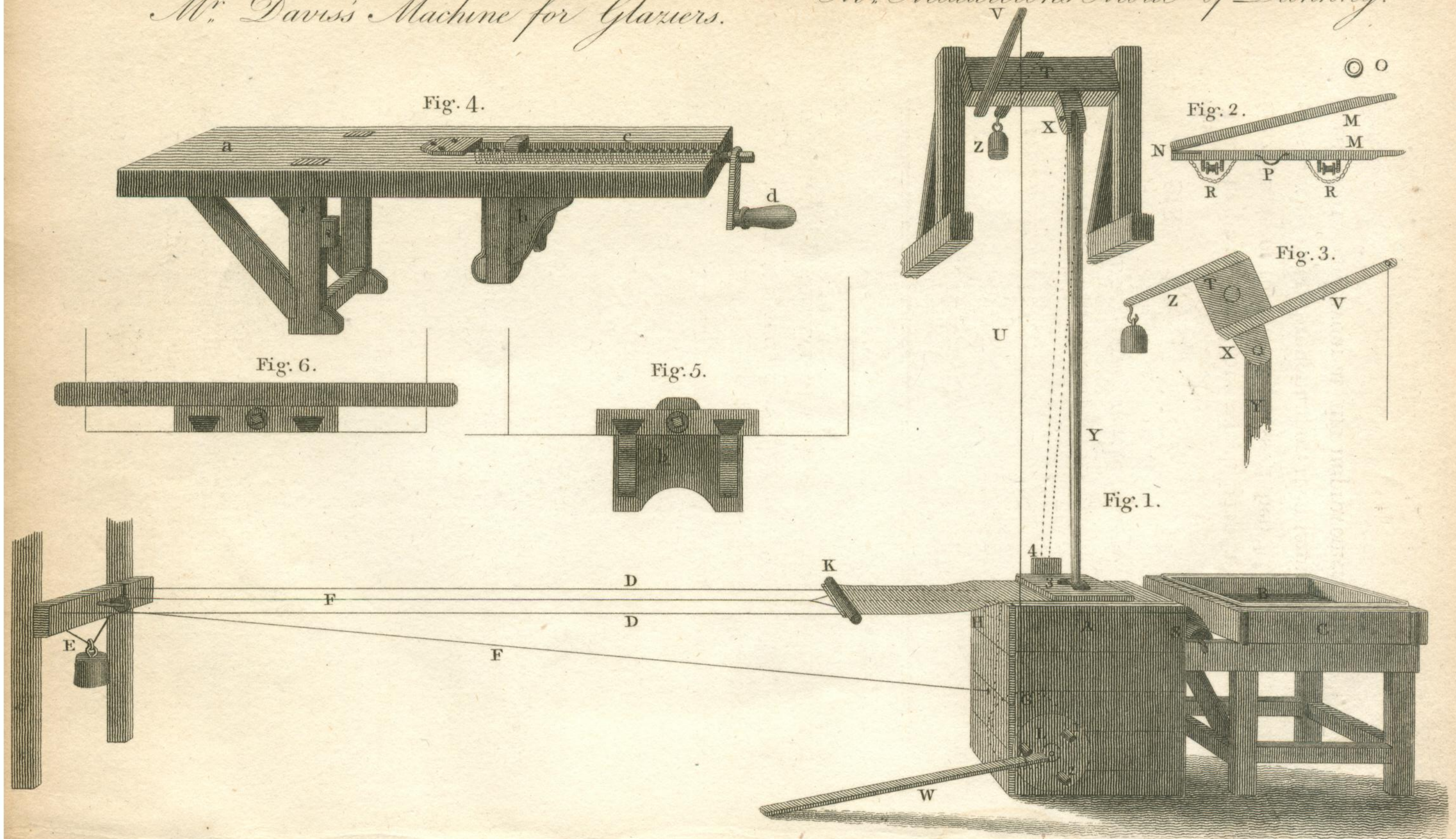
THE frequent accidents which happen to Painters and Glaziers, from the unsteadiness of their Machines, and the consequent misery brought upon their families, have stimulated me to endeavour at the improvement of such Machines.

The

Pl. IX.

Mr. Davis's Machine for Glaziers.

Mr. Middleton's Mode of Printing.



C. Varley del.

S. Porter sculp.

The model, which I have the honour of forwarding to you, will, in my opinion, answer the purpose in view. Generally, as you will see, the machine may be used without the guard; and while perfectly firm and secure, it will cause no injury to the wainscoting or paint. But where the windows are flush with the floor, and where no under security can be depended upon, the guard may be applied with advantage.

I have the honour to be,
Your very humble Servant,
JOS. DAVIS.

Crescent, Kingsland-Road, Nov. 25, 1805.
To Dr. C. Taylor.

Reference to Mr. J. Davis's Machine for Painters and Glaziers. Plate IX. Fig. 4, 5, 6.

Fig. 4. Represents the Machine; the part *a*, is similar to that used by glaziers, which is placed on the outside of the window. *b*, is an additional moving piece, which presses against the inside of the window-frame, and is brought nearer to, or removed farther from it, by means of the male-screw *c*, and its handle *d*.

Fig 5. Shows the lower part of a window, and the manner in which the moving-piece *b*, including a female-screw, acts against the inside of the window-frame.

Fig. 6. Shows a cross-bar introduced in place of the moving-piece last mentioned, which bar extends from one window-side to the other, and explains how the machine may be used, where any injury might arise from screwing the moving-piece in the centre of the recess of the window.

The general improvement consists in the use of a screw on that end of the frame which is within the house, and which keeps the machine steady and firm, instead of the two upright irons, which are put through holes made in the top plank of the machine, in the common mode, and which occasion the machine to be very unsteady in use, and liable to accident. There are two blocks marked *d*, *d*, in Fig. 4, which may be occasionally put in, or taken out, according as the stone-work under the window may require.